A205 A Retrospective Critical Evaluation of Statistical Techniques Utilized in Clandestine Drug Profiling

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After attending this presentation, attendees will recognize the need to consider which statistical techniques are appropriate prior to analysis being carried out and gain awareness of issues relating to some of the statistical methods previously used for drug profiling.

This presentation will impact the forensic science community by encouraging consideration of statistical approaches to data processing prior to analysis, identifying the appropriateness of statistical techniques currently utilized in drug profiling, and questions that need to be answered relating to some of these.

Selection of statistical methods for clandestine drug profiling is often not considered in detail prior to application and where consideration is made, the basis is frequently identification of common practice or testing a variety of approaches against known results. There needs to be reference to the underlying assumptions or distributional requirements when deciding upon the appropriate statistical technique.

Reliable, robust methods for identification of illicit compounds are essential to many involved in law enforcement. This process includes not only direct identification of the compounds but is also coupled with the determination of methods of manufacture and ability to associate seizures. Physical and chemical profiling of illicit drugs aims to establish whether or not there are links between seizures.[1,2,3]

A wide variety of statistical methods have been applied to both the physical and analytical measurements of illicit drug samples in attempts to establish similarity, or lack thereof, between samples.[1,5,6] Approaches to selection of the technique to utilize vary from “what everyone else does” to “what gives the best fit to what we know to be true.”

In fact, many statistical techniques are based upon assumptions relating to the data set being analyzed or rely upon properties of the data set to produce results. Yet these techniques are utilized without consideration of this in drug profiling.

The extent of evaluation of both analytical and statistical approaches varies by drug type — synthetic, semi-synthetic, or natural — and by drug. For synthetic drugs, there has been extensive research into drug profiling, including a harmonized analytical and statistical method for amphetamine profiling.[1] Research relating to semi-synthetic drugs (cocaine and heroin) is less abundant and, for natural drugs such as cannabis, is limited, as identified by Groger *et al.*[4]

This abstract presents a review of the statistical techniques which have been utilized in profiling of clandestine drugs from each of the synthetic, semi-synthetic, and natural drug groupings. The assumptions for each of the approaches followed are identified and evaluated in the context of current understanding of the properties of the drug profiles. Such consideration allows the identification of key issues in selection and evaluation of appropriate statistical methodologies across a wide range of illicit drugs.

For the first time, this research will critically evaluate the use of statistical methods within the context of drug comparison. Foreseeable impact of this is recognition of the need to consider which statistical techniques are appropriate prior to analysis being carried out. This will allow inferences to be correctly drawn by forensic scientists and law enforcement bodies when profiling clandestine drug seizures allowing appropriate and reliable both by the laboratories but also between laboratories and across borders.

References:

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